UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

DATE: JUN 14 2017

SUBJECT: Request for Concurrence on Region 2's Recommendation That a National Remedy Review Board Review is Not Warranted for the Wolff-Alport Chemical Company Superfund Site Proposed Remedy and Request for Approval of Permanent Relocation of Tenants at the Site

FROM: John Prince, Acting Director
Emergency and Remedial Response Division

TO: James E. Woolford, Director
Office of Superfund Remediation and Technology Innovation

Introduction and Purpose

The purpose of this memorandum is to (1) provide Region 2's rationale for its recommendation that the proposed remedial action at Operable Unit 1 of the Wolff-Alport Chemical Company (WACC) Superfund site, located in Ridgewood, Queens, New York, does not warrant a National Remedy Review Board (NRRB) review and solicit your concurrence on this recommendation, and (2) seek your approval on Region 2's proposal to permanently relocate tenants at the site.

OSWER Directive 9285.6-21, *National Remedy Review Board Criteria Revision and Operational Changes*, September 4, 2014, calls for regions to implement a regional remedy review team (RRRT) to evaluate Superfund site response actions costing between $25 million and $50 million to determine if a full NRRB review is warranted. The proposed remedial action is estimated to cost $38.8 million. The Region 2 RRRT has reviewed the WACC proposed remedy and recommended to me that a full NRRB review is not warranted.

Regional Remedy Review Team Process

Region 2 has established an RRRT independent of site project teams to conduct objective reviews of Superfund response actions. The core group of the RRRT is comprised of the site remedial project manager (RPM), site remedial section and branch chiefs, other section chiefs, site risk assessor, site hydrogeologist, site attorney, another Superfund branch chief, and the regional NRRB representative. For each review, additional RRRT members are invited to participate based upon the needs of the project, and generally include non-site team subject-matter experts. For the WACC site project, the additional RRRT members included an acting branch chief and staff member from an independent branch with radiation expertise.

On April 20, 2017, the RPM for the WACC site presented the following information to the RRRT:

- WACC site setting and history;
- EPA removal actions associated with reducing potential radiation exposure;

- Results of the remedial investigation (RI), including human health and ecological risk assessments;
- Detailed descriptions and discussion of the Remedial Action Objectives (RAO) and remedial alternatives;
- Conceptual site model;
- Detailed description of the preferred alternative, including cost; and
- Community and state perspectives

The presentation concluded with a question and discussion session among the RRRT and the WACC site team. This included a review of the decision criteria from Directive 9285.6-21 and examination of the site and the proposed remedial action with regard to innovative remedial technologies, principal threat waste, risk assessment, community interests, and state involvement.

Site Information and Removal Response Actions

The WACC operated on a portion of the 0.75-acre site from the early 1920s to 1954, importing monazite sand via rail and extracting rare earth metals from the material. Monazite sand contains approximately 6% to 8% of thorium and 0.1% to 0.3% of uranium. The liquid wastes were disposed of in the sewer system and the solid wastes were likely spread or buried on the property.

According to the U.S. Department of Energy, the Atomic Energy Commission (AEC) ordered WACC to halt the sewer disposal of the thorium wastes in 1947. Thereafter, thorium was precipitated as thorium oxalate sludge and sold to the AEC.

From 2012-2014, the EPA Removal Program completed actions to reduce potential radiation exposure, including the installation of lead, steel, and concrete shielding within several on-property buildings, the installation of a radon mitigation system to address radioactive gas in the interior space of one business and the installation of a fence around a vacant parcel of land adjacent to the affected businesses to prevent trespassing onto an area where radiation contamination is present.

Radiological data collected through a multiagency effort within a half-mile vicinity from the site in 2013 indicated that there is no elevated off-site exposure to the surrounding community from radiological contaminants located on-property and in areas directly adjacent to the property.

The site was included on the National Priorities List in May 2014. Field work was conducted from September 2015 to March 2017. The work included radon testing at a nearby public school and daycare center; the performance of a gamma radiation survey of the sewer system leading from the property; and the collection of on- and off-property soil samples (including the above-noted school and daycare center), on- and off-property groundwater samples, and sediment samples from the East Branch of Newtown Creek, which is the outfall location for the sewer system leading from the site.

The results of the RI indicate that contamination is embedded in building structures, primarily in buildings that previously operated a kiln/vat in which monazite sands processing took place (Lots 42 and 44; see Figure 1, attached), in the basement of a deli (Lot 46), and, to lesser extent, in a warehouse on Lot 33 that was constructed on the former yard area. Previous investigations found concentrations of radon and thoron above screening criteria in the indoor air. Radiological contamination extends to a maximum depth of 28 feet below-ground-surface. The highest Th-232

concentration observed was found in Lot 42, at 760 picocuries per gram (pCi/g) from 10 to 12 feet below ground surface. Surficial contamination was observed in the former rail spur area, the intersection of Irving Avenue and Moffat Street, the northern portion of Moffat Street and the eastern portion of Irving Avenue, and in southeastern corner of Lot 31. The soil contamination appears to have been primarily due to filling in the area with process tailings. Other surficial contamination was likely caused by stockpiling of monazite sands and tailings in the former storage yards, allowing rainwater to transport contamination to lower topographic areas.

A sewer investigation found significant radionuclide contamination present in the combined sewer system originating at the WACC property. Gamma count measurements (greater than 20 times background) were significantly elevated in manholes south of the WACC buildings on Irving Avenue where process liquors containing thorium were likely discharged. The sewer discharges to Newtown Creek. Sediment concentrations of thorium at the Newtown Creek outfall were below guidelines for the protection of biota

While volatile organic compounds (VOCs) exceed screening criteria in on-site groundwater, there were no known VOC uses at the facility. VOCs were not detected in soil samples, and an upgradient groundwater sample showed elevated concentrations, leading to the conclusion that the on-site VOC concentrations were due to a non-site-related upgradient source.

A site-specific human health risk assessment and screening level ecological assessment were completed as part of the RI. While the current land use is industrial, the predominant land use in the surrounding area is residential (attached houses and apartment buildings), and the neighborhood is near areas of Brooklyn that have been under intense redevelopment (primarily to residential) over the past 10 years. Therefore, a change in land use to residential was considered in the risk assessment, as is discussed in more detail below.

Due to the developed nature of the site, direct exposure to chemicals of potential concern (COPCs) in the soil (*i.e.,* direct contact with contaminated soil, as opposed to exposure to radiation emanating from the soil, which is discussed under complete exposure pathways, below) is limited for current receptors. In addition, groundwater is not currently used for any purpose at or near the site; therefore, direct exposure to contaminants in groundwater was not evaluated for current receptors.

Complete exposure pathways for current, commercial receptors to radionuclides of potential concern include external gamma radiation from soil, external gamma radiation from outdoor and indoor surfaces, and inhalation of radon and thoron in indoor air. Cancer risks were estimated for non-radon-related cancer risks and radon-related cancer risks.[1] Non-radon-related cancer risk for commercial indoor workers and industrial workers exceeds EPA's target cancer risk range, primarily due to external exposure to Thorium-232 (Th-232) and its associated decay products (over 90 percent), with the majority of the remaining fraction associated with Radium-226 (Ra-226). Inhalation of dust particles and soil ingestion pathways make negligible contribution to risk.

[1] Cancer slope factors provided in the RESidual RADioactivity, Department of Energy computer model (RESRAD) Onsite Version 7.2 model and in the online EPA PRG Calculator for Radionuclides were used by EPA's contractor, CDM Smith, for radionuclides. CDM Smith also completed a comparison of risk and dose estimates estimated by the PRG calculator and RESRAD 7.2. Both methods were used to estimate cancer risk from radionuclides and the results from both methods support the need to take action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Cancer risk due to exposure to radon was estimated to be significantly higher than exposure to external gamma radiation. The cancer risk from radon was 2×10^{-3} for the current and future commercial indoor worker, as well as the future industrial worker (or double the Th-232 risk). It was estimated at 3×10^{-3} for the future industrial worker (or three times the Th-232 risk).

To reduce potential radiation exposure to workers over the short term, EPA installed shielding in most of the work areas and radon mitigation systems in some areas on the WACC property in 2013. Shielding was shown to be effective in reducing exposure when only concrete was used, and even greater protection was provided where the denser steel and lead shielding was installed.

Risks for both future indoor and industrial workers are anticipated to be much the same as risks for current workers. Any future commercial or industrial construction is likely to have a substantial on-slab foundation, which should provide much the same shielding as the shielding previously put in place. Total cancer risk for future workers considering shielding from a foundation and, excluding radon, ranged to 3×10^{-3} and to 4×10^{-3}, including radon. Cancer risks for future workers assuming no cover of the contaminated zone range as high as 5×10^{-3}. Future development of the site would require construction workers to be on-site without the benefit of shielding on a full-time basis. The cancer risk for construction workers would be about 5×10^{-5}. For utility workers exposed to sewer sediment, the cancer risk would be about 2×10^{-4}. Future risks for the general public and for offsite receptors are assumed to be similar to current risks for these receptors. High risk estimates (above 1×10^{-4}) for workers suggest some potential for the general public to experience exposure above regulatory thresholds.

Non-radiological cancer risk exceeds EPA's target threshold for future residents and is at the upper end of EPA's target range for industrial workers. The primary COPC cancer risk drivers are Aroclor 1260 and benzo(a)pyrene in surface soil. Hot spots for these COPCs are present on the WACC property (but not necessarily collocated with radiological waste exceeding the Preliminary Remediation Goals [PRGs]). Noncancer health hazards associated with exposure to surface soil for future residents exceed the target threshold due to exposure to Aroclor 1260 and selenium. Noncancer health hazards associated with exposure to surface soil for future industrial workers also exceed the target threshold due to exposure to Aroclor 1260. Cancer risk for future construction/utility workers exposed to COPCs in surface/subsurface soil is within EPA's target range of 1×10^{-6} to 1×10^{-4}. Noncancer health hazards associated with exposure to surface/subsurface soil for future construction/utility workers exceed the target threshold due to exposure to Aroclor 1260.

Although the site is currently located in an industrial area, there is a substantial possibility of residential use in the near future. Buildings in the area, currently zoned for commercial use, have been converted to mixed residential/commercial use. To address this possibility, the risk assessment also evaluated potential residential use of the property. Total cancer risk for future on-property residents, excluding radon and the consumption of home-grown produce is approximately 5×10^{-3}. Cancer risk was dominated by external exposure, which accounts for 80 to 90 percent of estimated risk. Th-232 and its associated decay products was responsible for most (greater than 90 percent) of the risk due to external exposure. The total cancer risk estimate, including radon, is 1×10^{-2}. The total cancer risk estimate for all exposure pathways is 2×10^{-2}. Cancer risks are highest at year 10 where consumption of home grown produce accounts for about 45 percent of the total risk, exposure to radon accounts for about 32 percent of the risk, and external exposure accounts for about 22 percent of the total risk.

The site is in an industrial area with no environmentally sensitive areas (*e.g.*, wetlands) and only limited habitat for most types of ecological receptors; thus, adverse exposures for ecological receptors at the site are unlikely. The evaluation focused on risks to ecological receptors exposed to the site-related combined sewer outflow discharges in Newtown Creek (approximately 1.9 miles to the northwest). Newtown Creek is a tidal arm of the New York-New Jersey Harbor Estuary. Maximum and mean radionuclide concentrations measured in sediment were compared to biota concentration guides (BCGs) for riparian animals in the aquatic ecosystem. The results of the screening evaluation verify that radionuclide concentrations in sediment in the East Branch of Newtown Creek are significantly less than BCGs and that dose to receptors is below biota dose limits.

Based upon the findings of the risk assessment, the media of concern include the WACC building materials, soils underlying the WACC buildings, surficial soils extending beyond the WACC buildings, sewer pipes and manhole materials near the WACC property, and indoor air.

Proposed Remedial Action

Remedial Action Objectives

The Remedial Action Objectives for the site include:

- Reduce or eliminate human exposure via inhalation of radon and thoron, incidental ingestion, dermal adsorption, and external exposure to radiological contamination present within the buildings to levels protective of current and anticipated future use by preventing exposure to contaminant levels above preliminary remediation goals.
- Reduce or eliminate human exposure threat via inhalation, incidental ingestion, dermal adsorption, and external exposure to contaminated soils and solids.
- Prevent/minimize migration of site contaminants off-site through surface runoff, dust particulate migration, and combined sewer overflow discharge.

Preliminary Remediation Goals

The PRGs for this site are summarized in the table, below.

Contaminants of Concern	**Preliminary Remediation Goal**
Soil	
Aroclor 1260	1 milligram per kilogram (mg/kg)
Benzo(a)pyrene	1 mg/kg
Thorium-232 and Radium-226[2]	5 pCi/g
Indoor Air	
Radon-222 and Radon-220[3]	0.02 working level

Four remedial alternatives were evaluated in the feasibility study:

[2] Radium-226 is used to indicate Uranium-238 levels. Screening criterion for radon in indoor air in the basement is 1.2 picocuries per liter (pCi/L) and in the first floor is 0.5 pCi/L. RI screening criteria for radon and thoron for outdoor air is 0.1 pCi/L each.

[3] These actions will also attain the 4 pCi/L indoor radon guidelines for the public.

Alternative 1–No Further Action

Alternative 2–Temporary Relocation of Tenants, Targeted Building Demolition, Installation of Additional Shielding, Shallow Soil Excavation, Soil Cover over Remaining Contamination, Sewer Removal/Cleaning, Off-Site Disposal, and Institutional Controls

This alternative consists of the following major components:

- Temporary relocation of five tenants in buildings on Lots 42, 44, and 46
- Demolition of the warehouse building on Lot 33 (dilapidated state and unfit for occupancy)
- Excavation of shallow contaminated soils exceeding the PRGs to depth of 2 feet
- Excavation of contaminated sewer pipe and contaminated soil around the sewer pipe along former facility and jet washing of other portions of the sewer pipe
- Disposal of building debris, excavated soils, sewer pipe and sediment in a permitted landfill for radioactive waste
- Installation of additional radiation shielding within buildings on Lots 42, 44, and 46 and basement side wall of building on Lot 46
- Institutional controls
- Long-term monitoring

Under this alternative, an estimated 12,900 cubic yards (cy) of contaminated soil and debris would be excavated and disposed of off-site. It is estimated that the remedial action would take one year and five months to implement. The estimated present-worth cost is $35.8 million.

Because this alternative would result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years.

Alternative 3 –Permanent Relocation of Tenants, Demolition of WACC Buildings, Shallow Soil Excavation, Soil Cover of Remaining Contamination, Sewer Removal/Cleaning, Off-Site Disposal, and Institutional Controls

This alternative consists of the following major components:

- Permanent relocation of tenants in WACC buildings
- Demolition of all WACC property buildings
- Excavation of shallow contaminated soils exceeding the PRGs to a depth of 2 feet
- Excavation of contaminated sewer pipe and contaminated soil around the sewer pipe along former facility and jet washing of other portions of the sewer pipe
- Post-excavation sampling
- Disposal of building debris, excavated soil, sewer pipe, and sediment in a permitted landfill for radioactive waste
- Institutional controls
- Long-term monitoring

Under this alternative, an estimated 13,300 cy of contaminated soil and debris would be excavated and disposed of off-site; however, soils exceeding the PRGs would remain at depths below 2 feet.

It is estimated that the remedial action would take one year and six months to implement. The estimated present-worth cost is $32.5 million.

Because this alternative would result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years.

Alternative 4 – Permanent Relocation of Tenants, Demolition of WACC Buildings, Soil Excavation, Sewer Removal/Cleaning, and Off-Site Disposal

This alternative consists of the following major components:

- Permanent relocation of tenants in WACC buildings
- Demolition of all WACC property buildings
- Excavation of all soils exceeding PRGs
- Excavation of contaminated sewer pipe and contaminated soil around the sewer pipe along former facility and jet washing of other portions of the sewer pipe
- Disposal of building debris, excavated soil, sewer pipe, and sediment in a permitted landfill for radioactive wastes

Under this alternative, an estimated 17,300 cy of contaminated soil and debris would be excavated and disposed of off-site. It is estimated that the remedial action would take one year and seven months to implement. The estimated present-worth cost is $38.8 million.

Because this alternative would not result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure, five-year reviews would not be necessary.

Preferred Remedial Action

The WACC site team has selected Alternative 4, Demolition of WACC Buildings, Soil Excavation with Off-Site Disposal, and Sewer Removal/Cleaning, as its preferred remedy for the site.

While Alternative 2 is approximately $3 million less costly than Alternative 4, the most-costly alternative, it requires the disruption of the five tenants twice (temporary relocation) and leaves significant levels of radiological contamination in-place in both the structures and underlying soil (which would also continue to produce radon/thoron gas) that would necessitate institutional controls, maintenance, and long-term monitoring to be protective. Furthermore, the additional shielding required by Alternative 2 would limit the ability of one of the tenants, an auto body shop, from conducting business, as there would not be sufficient space to lift automobiles for repairs. In addition, the ability to ensure that the institutional controls remain in place in such a setting as the WACC buildings would be difficult.

While Alternative 3 is the least costly action alternative and removes the radiologically-contaminated building materials and much of the contaminated soils, because some contaminated soil will remain, institutional controls would be necessary to restrict the future use of the property; ensuring such controls remain effectively in place can be difficult. Since the radioactive half-life of Th-232 is 14 billion years, institutional controls, maintenance, and long-term monitoring would need to be managed in perpetuity. Alternative 4 avoids the problems associated with such issues,

because it permanently relocates the tenants and removes the radiologically-contaminated building materials and underlying contaminated soils, thereby allowing unlimited future use of the property.

NRRB Review Decision

Based on the RRRT briefing and subsequent discussion, the RRRT concluded that a review of the preferred response action by the NRRB would not be necessary. Factors forming the basis of this decision are:

1. The preferred remedial action would comply with all federal and state Applicable or Relevant and Appropriate Requirements.
2. Community and local government leaders responded positively to EPA's removal action and support continuing response actions.
3. There is general support of the New York State Department of Environmental Conservation for the preferred remedial action.
4. The preferred response action eliminates the source area, thereby eliminating the need for institutional controls and long-term maintenance and monitoring in perpetuity.
5. The preferred response action represents the best available, cost-effective means of addressing the contamination at the WACC site. While Alternative 4 is the costliest alternative, the cost estimates for Alternatives 2 and 3 include long-term maintenance of the shielding and radon mitigation, along with long-term monitoring of the site, that are only costed out to 30 years. Given the half-lives of the radiological COPCs, a 30-year time frame is unrealistic, and the "in perpetuity costs" that are outside of EPA's normal cost-estimating horizon, are expected to be substantial.
6. All of the components of the preferred response action are readily implementable and the technologies are standard throughout industry and EPA Superfund programs.

Consultation for Radioactively-Contaminated Sites, Permanent Relocation of Tenants, and Response Action at Site with Contamination in Buildings

OSWER Directive 9200.1-33P, *Headquarters Consultation for Radioactively Contaminated Sites*, OSWER Directive 9360.3-24, *Analyzing Compensation Alternatives for Partly or Completely Demolishing Structures*, OSWER Directive 9360.3-12, *Response Actions at Sites with Contamination in Buildings*, and OSWER Directive 9360.3-20, *Response Actions that Affect Residential or Commercial Structures*, require consultation with the appropriate Office of Superfund Remediation and Technology Innovation staff. Region 2 consulted with Stuart Walker and Robin Anderson (radiological contamination) on April 27, 2017, Ji-Sun Yi (building demolition) on May 18, 2017, and Rich Norris (permanent relocation) on May 25, 2017. Comments that were raised during the consultations have been addressed.

Recommendation

Your concurrence that a review of the proposed remedial action for the WACC site by the NRRB is not necessary and with permanently relocating the five tenants is requested.

A draft Proposed Plan was provided to Ji-Sun Yi on May 26, 2017. Issuing a Record of Decision for the WACC site is a Regional commitment for this fiscal year.

My staff and I are available to discuss the WACC site. Please call me at (212) 637-4380 if you require any additional information.

Attachment

cc: Amy Legare, Chairman, NRRB
Douglas Ammon, OSRTI
Robin Anderson, OSRTI
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Figure 1—Wolff-Alport Chemical Corporation Site